

# Weapons of Mass Destruction Terrorism Preparedness & Response

## Chemical & Biological Arms Control Technologies: Applications to Homeland Defense

Presented By:

Cathleen M. Hoefler

Technology Development (TD) Directorate

Chemical and Biological (CB) Arms Control Technology Branch

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## CW/BW ARMS CONTROL TECHNOLOGY (TDCB) MISSION

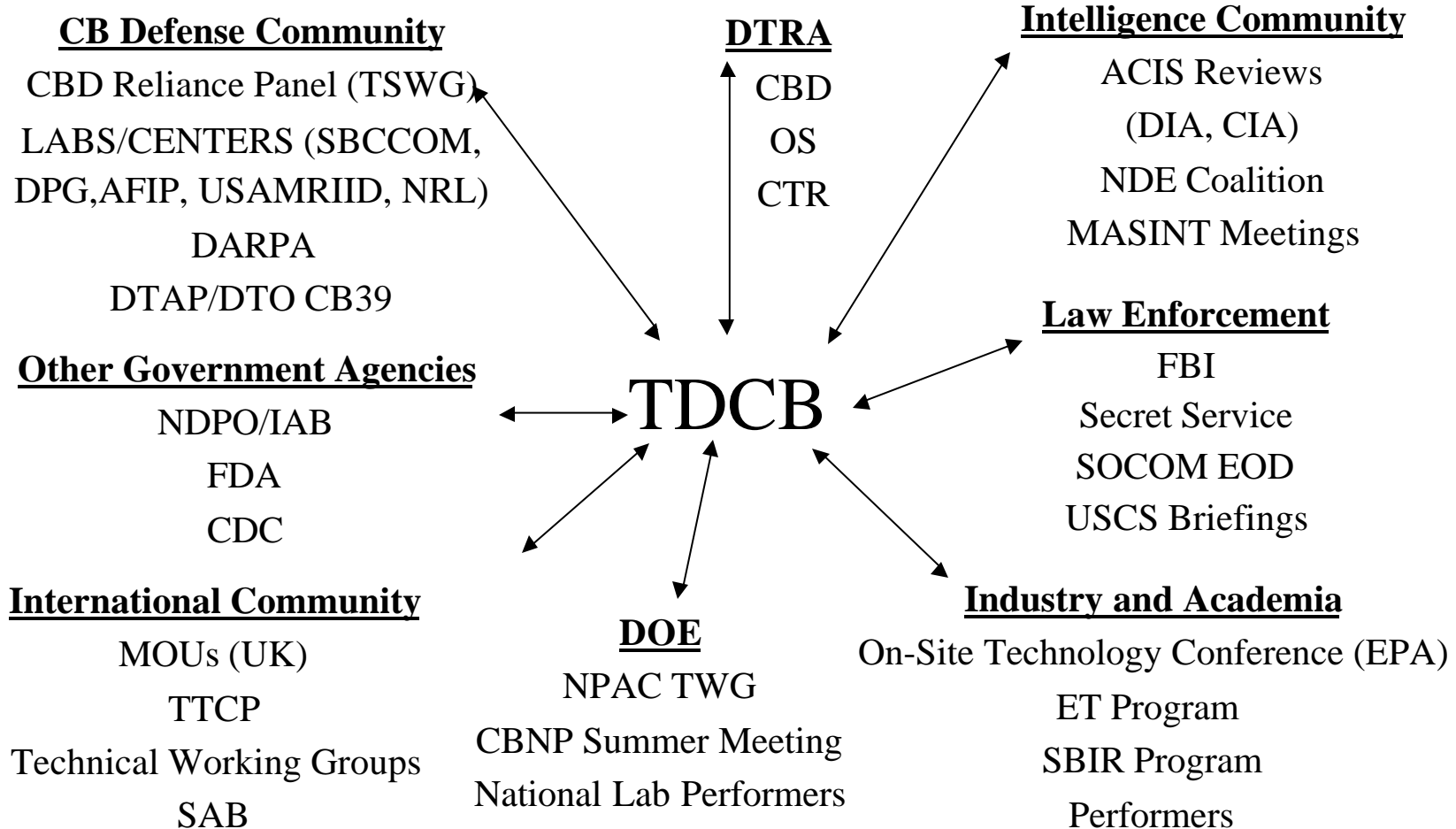
Develop technology needed for DoD activities involving CW and BW arms control & non-proliferation activities, to include implementation, verification, and inspections.

- ◆ Provide technical support and data analysis for arms control negotiations
- ◆ Provide technology capability and support to enable the U. S. Government to protect its rights and comply with arms control agreements

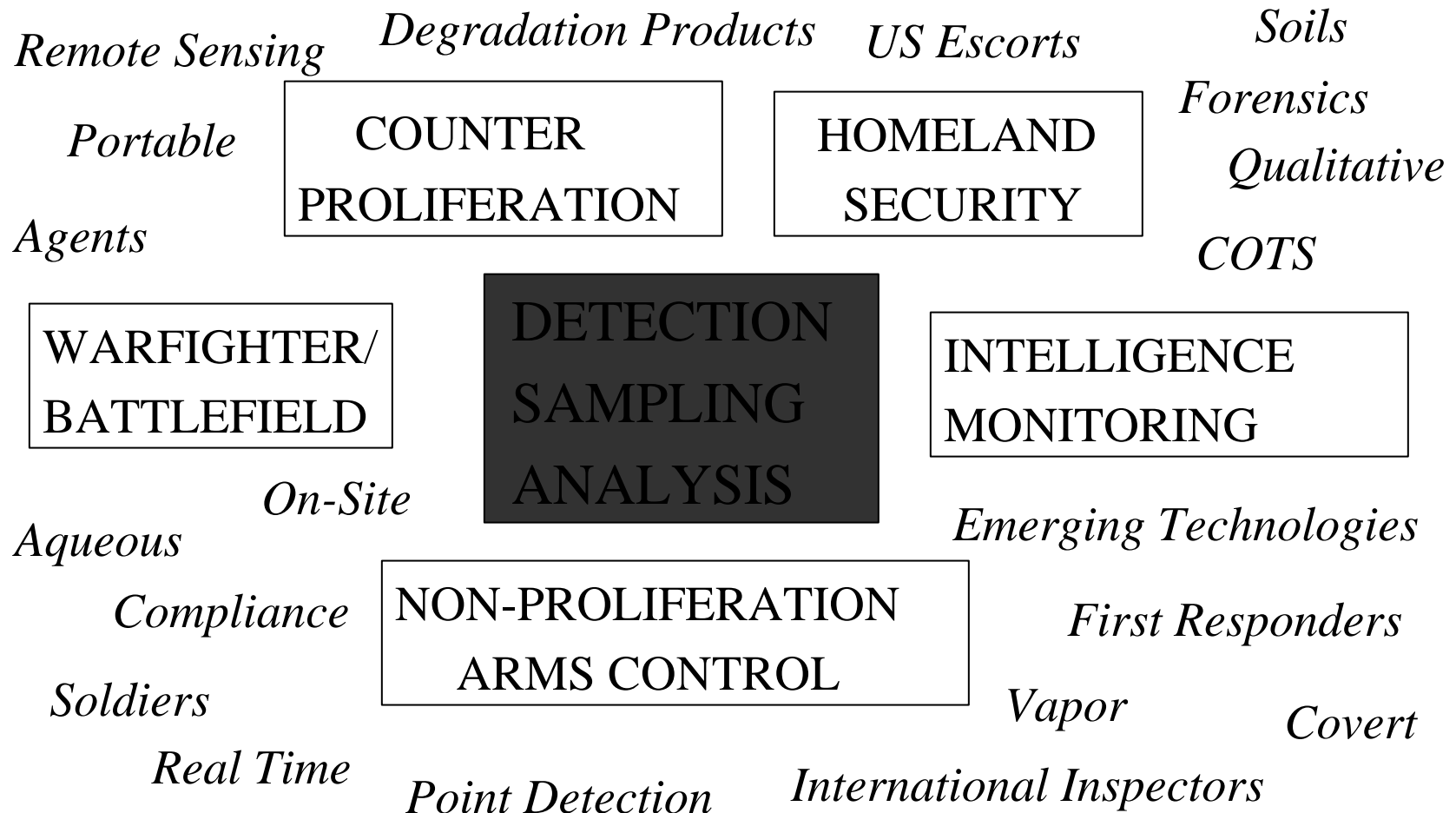
## CW/BW ARMS CONTROL TECHNOLOGY MISSION PRIME DIRECTIVE

◆ Conduct R&D efforts to enhance data analysis and technology capabilities used during US participation in CW and BW Arms Control and Non-Proliferation activities to not present a threat to DoD equities and national security interests

# TECHNOLOGY INTERFACE



# COMMON REQUIREMENT CORE



**DTRA**

# ARMS CONTROL TECHNOLOGY PROGRAM DRIVERS

## Treaty Provisions

Prohibited Items

Matrices

Inspection Type

Time Constraints

Detection Limits

## User Requirements

Portability

Size

Operability

Safety

Speed

## US Law/Policy

Regulatory Restrictions

Ratification Provisions

Export Control

Trade

\*First Responder Technology Drivers

# CW and BW TECHNICAL INFORMATION PRODUCTS

- **Objective:** Support OSD Policy and US Delegations with data & analysis. Identify technology gaps

- **Payoff:** Sound technology development, DoD equities protected

- **Challenges:**

CWC: Senate Conditions (restrictions) 4 & 18

BWC: Highly Bracketed Text (no agreement)

- **Recent Progress/Plans:**

R&D Compendium & Database Web Directory

CWC -Ad Hoc Group- BioMedical Samples

BWC - ABO Encyclopedia



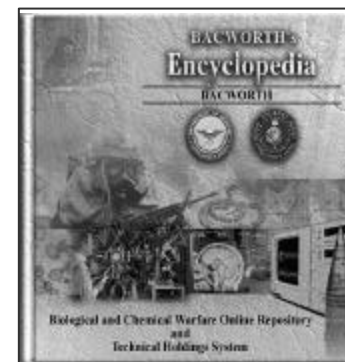
## **“APOTHECARY”**

SEARCH:

Data Sources/SARIN/degradation

SEARCH:

CW Detection/Conductive Polymers



**DTRA**

# MATRICES/ TARGETS FOR SCREENING



*WASTE/DISCHARGE STREAMS*

*SOILS*



*AIR/VAPOR*



*SOLIDS/VEGETATION/WIPES*

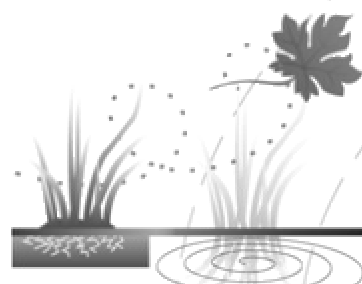


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# CWC: ON-SITE INSPECTION TECHNOLOGIES

## Sample Collection/Screening



**Sample Matrix**

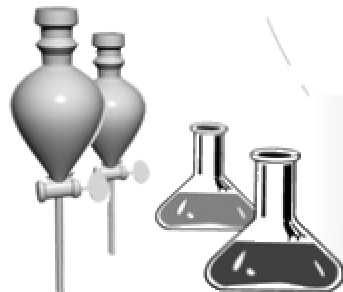
air  
soil  
water  
vegetation

**Non-Destructive Analysis**

munitions



## Sample Preparation



**GC/MS Analysis**

samples



**Determinative Analysis**

**DTRA**

## CW SCREENING TECHNOLOGIES

- Photo-Ionization MS - Fragment-Free/Primary Ion-T
- Low Power GC for S/P Detection - T
- Conductive Poly Sensor for Aq Matrices -D
- Conductive Poly Sensor: Air/H-space Screening-D
- Micro-Sensor Using Metal Oxide Coatings-D
- Automated Colorimetric Test Kit-F/D
- Wipe/Swipe Towel Using Colorimetric Enzyme-D
- GC/MIME:Pattern Recognition/Coated Materials-D

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D -Development T-Test F -Field

# CW SAMPLE COLLECTION & SCREENING Technology Example

**Objective:** Meet requirement for rapid  
portable sample screening

- Matrix: Aqueous Samples
- Automated version of military test kits (M272/M256)
- Uses microfluidics to combine sample with reagents to change color based on presence of nerve agent
- Resulting color formation read by credit-card sized spectrophotometer
- Developer: Constellation Technology Corporation, Largo FL.



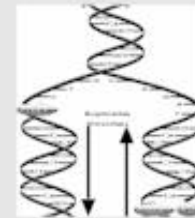
Pisces Prototype™

# BWC: SAMPLING AND ANALYSIS TECHNOLOGIES

Sample Collection/Screening



Sample Preparation



Confirmatory Analyses

- Immunological
- Genetic (PCR)
- Classical Microbiology

# BW COLLECTION & SCREENING TECHNOLOGIES

- Hand Held Assay-D/T
- Polymerase Chain Reaction (PCR): Primers/Probes- D/T
- Cellular Function Based Assays-D
- Bacterial Endospore Detector T/D
- Optical Fiber Simultaneous Orthogonal Detection-D
- Magichip-T
- MALDI TOF-D

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D-Development T -Testing

F-Field

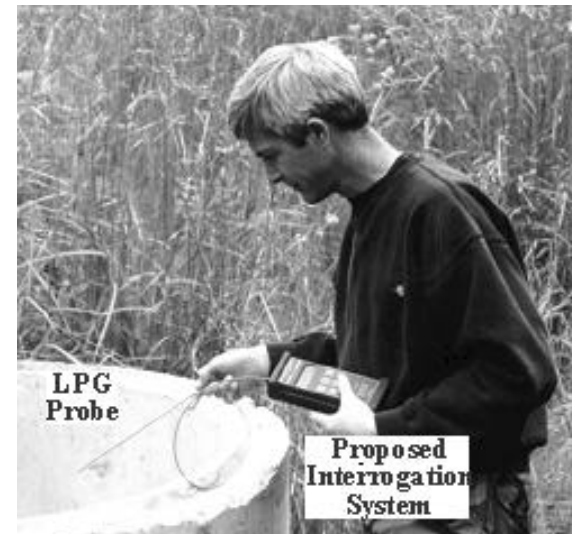
***DTRA***

# BW SAMPLE SCREENING

## Technology Example

**Objective:** Develop rapid, sensitive, and portable system for the simultaneous orthogonal detection of multiple BW agents

- Matrix: Aqueous
- Direct detection and fluorescent methods measure captured targets.
- Results down to ng/ml levels for proteinaceous targets
- Developer: Luna Innovations



*Long Period Grating (LPG)-  
Based Optical Fiber Fluorescent  
Sensor*

# NON-DESTRUCTIVE EVALUATION TECHNOLOGIES

- Swept Frequency Acoustic Interferometry- F
- Advanced Non-Destructive Evaluation -T/D
- Next Generation ANDE-D
- Portable Isotopic Neutron Spectroscopy -F
- Mini-PINS - T/D
- Portable Neutron Generation System -D

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D -Development T - Testing F-Field

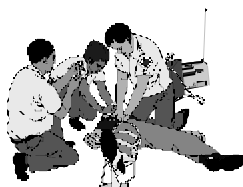
# MULTIPLE TARGETS FOR NDE



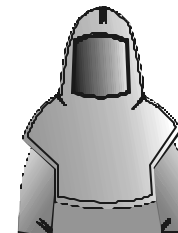
POLITICAL CONVENTIONS



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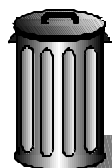
MILITARY FACILITIES



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FIRST RESPONSE HAZARDOUS EVENT



?



INTERNATIONAL SPORTING EVENTS



UN INSPECTED FACILITIES

EXCAVATION SITES



BORDERS & POEs

**DTRA**



# NDE TECHNOLOGY

## PINS and ANDE SUMMARY

**Objective:** interrogate & identify  
sealed container contents rapidly in  
the field

- CDR for ANDE in June (LANL)
- Prototype Mini-PINS (INEEL)

ANDE: **Stand-off** acoustic based  
swept frequency interferometry

PINS: Neutron beam molecular  
identification.



ANDE  
(URAM)



PINS

GOAL: Approach real-time analysis

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